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Report of the

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# MINISTERIAL TRADE DEVELOPMENT MISSION TO BRAZIL

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Led by The Honourable Alastair W. Gillespie  
Minister of Industry, Trade and Commerce

October 18-28, 1974



Industry, Trade  
and Commerce

Industrie  
et Commerce



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REPORT OF THE  
MINISTERIAL TRADE DEVELOPMENT MISSION TO BRAZIL

LED BY

THE HONOURABLE ALASTAIR W. GILLESPIE  
MINISTER OF INDUSTRY, TRADE AND COMMERCE

OCTOBER 18 TO 28, 1974







## TABLE OF CONTENTS

BACKGROUND	1
ORGANIZATION	2
STRATEGY	3
PROGRAM OF ACTIVITIES	4
MEMBERSHIP	6
PROGRAM	10
REPORT	14
SUMMARY OF BUSINESS INTERVIEWS	19
CONCLUSIONS	26
FOLLOW UP	28
ANNEX I - RAILWAY DEVELOPMENT	32
ANNEX II - MINING INDUSTRY	40
ANNEX III - HYDROELECTRIC DEVELOPMENTS	56

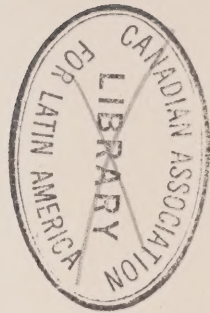


TABLE OF CONTENTS



1  
2  
3  
4  
5  
6  
10  
14  
18  
22  
26  
30  
34  
38  
42  
46  
50

BACKGROUND  
ORGANIZATION  
STRATEGY  
PROGRAM OF ACTIVITIES  
MEMBERSHIP  
PROGRAM  
REPORT  
SUMMARY OF BUSINESS INTERVIEW  
CONCLUSIONS  
FUTURE OF  
ANNEX I - BATTERY DEVELOPMENT  
ANNEX II - MINING INDUSTRY  
ANNEX III - HYDROELECTRIC DEVELOPMENT



The President of Brazil, General Ernesto Geisel, meets with the Hon. Alastair W. Gillespie, Canadian Minister of Industry, Trade and Commerce.





## BACKGROUND

For many years, but particularly over the past decade, Brazil has been a favourite subject of analysis for scholars and amateurs alike, drawn by the country's vast array of natural resources, its culture, its beauty, its people, its economy, its regional disparities. The size and variety of the components lend themselves readily to superlatives, which have not been spared.

But, it is the country's economic performance that occupies most analysts. The GDP has grown at about 10% per year, steadily, since 1968. Sectorial expansion has also been outstanding, particularly that of the manufacturing industry. Brazil's efforts to attain a position among world powers are being followed closely in international forums. The cynical remark of the sixties, that Brazil was "the country of the future ... and it always will be", no longer applies.

Undoubtedly, there will be controversy on the meaning of, and the need for, progress but it will be generally accepted that Brazil's presence is increasingly felt in international circles. One may argue about the methods used by its leaders to achieve economic and social objectives, but it will be difficult to deny that the Brazil of today bears only limited resemblance to that of 10 or 12 years ago. Its future is a matter of speculation but, if history is any indication, it should be a healthy one.

The now century-old trade relations between Canada and Brazil have been most rewarding, albeit far from spectacular: neither country is a major customer of the other. The reasons for this are varied and maybe not more than history. Bilateral trade has been growing steadily from about \$90 million in 1969 to around \$500 million in 1974. Our exports in 1974 will classify Brazil among the top eight markets for Canadian products in the world, and firmly in first place among our Latin American customers.

Doing business with Brazil has not been easy. Its rapid economic expansion and the growing sophistication of its industrial base (to say nothing of its businessmen), have challenged the ingenuity of our exporters. The Canadian response has been an increasing interest demonstrated by the level of activities of our exporters in that market. The Department of Industry, Trade and Commerce has given ample support to this drive.

## ORGANIZATION

Against this background, the Minister of Industry, Trade and Commerce, the Honourable Alastair W. Gillespie decided to lead a trade development mission to Brazil in October, 1974. The purpose of the mission was to strengthen and support Canada's marketing programs in Brazil, and to provide the opportunity for Canadian businessmen to demonstrate at the highest level Canada's interest in developing and intensifying the commercial relations between the two countries. It was expected that direct contact between Canadian and Brazilian government and business leaders would facilitate the discussion of Canadian manufacturing capabilities and technical expertise in relation to the Brazilian requirements for economic development.

It was considered advantageous to time those direct discussions after the new Brazilian administration had had the opportunity to measure and react to the changing structure of the world economic environment. In this manner, the discussions would clearly define the areas in which trade could be expanded, and the means to attain this objective.

Mission membership and activities were carefully planned to meet the main objectives of the mission.



### STRATEGY

Mission membership was the subject of strict and considered analysis, so as to ensure that, within logistics limitations, a wide range of Canadian capabilities and interests were properly represented. The program of activities for each member was structured in a manner which would expose him to both government and business leaders. Meetings were arranged with the President, General Ernesto Geisel, with key Ministers of his Cabinet, with senior government officials, and with high level executives of the Brazilian business, media, and academic communities.

The selection of mission members was balanced to include firms which had already succeeded in penetrating the market, as well as firms which were seeking an opening. Further a balance of interests was achieved by including not only exporters, but also importers, investors, and members of the academic community.

Media representatives were also part of the mission and had thus the opportunity to observe at first hand and report the potential of the Brazilian market.

PROGRAM OF MISSION ACTIVITIES

The mission was declared a success by its members. Even those members who did not complete any new businesses considered that it had provided them with valuable first hand knowledge of the market, and with an opportunity to discuss possible avenues with other members of the mission.

New business opportunities of about \$300 million were identified and numerous investment and joint venture prospects were discussed. And, more importantly, the Brazilian government and business leaders gained a fuller understanding of the possibilities for future cooperation between the two countries, and of the keen interest of the Canadian government and businessmen in pursuing them. Media coverage in Brazil and in Canada disseminated these developments to a wide audience during and after the mission. The resulting feedback still continues, and it is obvious that interest in the Brazilian market among Canadian exporters has reached new peaks.

RESULTS

The meetings and appointments took mission members to Brasilia, Sao Paulo, Rio de Janeiro, Parana, Rio Grande do Sul, and Minas Gerais. Salient features of their reports are summarized in the following pages.



MEMBERSHIP

Ministerial Party

The Honourable Alastair W. Gillespie,  
Minister of Industry, Trade and Commerce.

Michael Gillan,  
Executive Assistant to the Minister.

Lise Lachapelle,  
Special Assistant to the Minister.

Department of Industry, Trade and Commerce

C.T. Charland,  
Assistant Deputy Minister,  
Export Development.

F.R. Petrie,  
General Director,  
Western Hemisphere Bureau.

W.H. Chandler,  
General Director,  
Machinery Branch.

G.T. Keys,  
Chief,  
Marketing Services and Industrial Projects Division,  
Special Projects Branch.

L. Bustos,  
Mission Secretary,  
Latin America Division,  
Western Hemisphere Bureau.

J.P. Lambermont,  
Mission Coordinator,  
Fairs and Missions,  
Office of Export Programs and Services.

Export Development Corporation

S.P. Wheelock,  
Manager,  
Export Finance Division.

Department of External Affairs

J.S. Nutt,  
Director General,  
Bureau of Western Hemisphere Affairs.

Businessmen

Dr. R.S. Jickling, Vice President,  
Agra Industries Limited,  
Saskatoon, Saskatchewan.

Mr. R.F. Lewarne, Vice President,  
Brascan Limited,  
Toronto, Ontario M5L 1B7

Mr. L.A. Bourgeois, General Manager,  
Brazil-Canada Information Centre,  
Board of Trade Building,  
Toronto, Ontario M5H 1L9

Mr. Samuel Roth, Vice President, Marketing,  
CAE Industries Limited,  
Montreal 113, Quebec.

Mr. F.J.E. Lockhart,  
Chairman of the Board of Governors,  
Canadian Association for Latin America,  
Toronto, Ontario M5L 1B6

Mr. V.N. Stock, President,  
Canadian Corporate Management Co. Ltd.,  
Toronto, Ontario M5L 1E6

Mr. W.R.C. Blundell,  
Vice President and Division Executive,  
Canadian General Electric Co. Ltd.,  
Lachine, Quebec H3C 2S5

Mr. E.B. Griffith, Q.C., President,  
Canadian Importers Association Inc.,  
Toronto, Ontario.

Mr. H.M. Romoff, President,  
Canadian Pacific Consulting Services Limited,  
Montréal, Quebec H3C 3E4

Mr. A.J. Maloney, President,  
Canadian Saltfish Corporation,  
St. John's, Newfoundland A1C 5C8.

Mr. F. Veuger, President,  
Canmillex Sawmill Exports Ltd.,  
West Vancouver, B.C. V7V 1L1

Mr. R.E. Hatch,  
President and Managing Director,  
Canpotex Limited,  
Regina, Saskatchewan S4R 2R5

Mr. W.A. Rix, Jr., President,  
Charlottetown Metal Products Limited,  
Charlottetown, P.E.

Dr. Robert J. Wilson,  
Chairman and Scientific Director,  
Connaught Laboratories Limited,  
Willowdale, Ontario.

Mr. B.B. Bundesman, President,  
De Havilland Aircraft of Canada Limited,  
Downsview, Ontario M3K 1Y5

Mr. W.D. Black,  
Executive Vice President,  
Digitech Limited,  
Calgary, Alberta T2P 2V1

Mr. Max Drouin,  
President and General Manager,  
Dominion Engineering Works Limited,  
Lachine, Quebec H3C 2S5

Mr. T.R. Bell,  
Executive Vice President,  
Dominion Textile Limited,  
Montreal, Quebec H3C 3L1

Professeur André Poirier,  
Coordinateur adjoint des activités internationales  
Ecole des Hautes Etudes Commerciales,  
Montréal, Québec.

Mr. A.C. Cagney, President,  
Hermes Electronics Limited,  
Dartmouth, N.S. B2Y 4A1

Mr. Robert W. Stedman, President,  
Howe International Limited,  
Montreal, Quebec H3Z 1P9

Mr. Leslie C. McLean, Vice President,  
Stelco Technical Services Limited,  
Stelco Tower,  
Hamilton, Ontario. L8N 3T1



Dr. L. Boulet, Directeur,  
Institut de Recherches en Energie du Quebec - IREQ  
Varenes, Quebec J0L 2P0

Mr. K.A. Littzen,  
Vice President, Business Development,  
Montreal Engineering Company Limited,  
Montreal, Quebec H5A 1E3

Mr. D.A. Whelen, Chairman,  
Pacific Development Group,  
Vancouver, B.C. V6J 1V1

Mr. I.C. Rush, President,  
Polysar Limited,  
Sarnia, Ontario N7T 7M2

Mr. John Blacklock, Vice President,  
Saskatchewan Cattle Breeders Association,  
Blacklock Auction Service,  
Saskatoon, Saskatchewan.

Mr. David Kaufman, President,  
Silpit Industries (1970) Limited,  
Winnipeg, Manitoba R3B 1G7

Mr. D.A.J. Herbert,  
General Manager,  
Spiroll Corporation Limited,  
Winnipeg, Manitoba.

Mr. D.W. Russell, Vice President,  
SNC International Limited,  
Surveyer, Nenniger et Chenevert Inc.,  
Montreal, Quebec H3G 1N2

Mr. Ian S. Ross, President,  
Swan Wooster Engineering Co. Limited,  
Vancouver 5, B.C.

Mr. G.B. Champagne, President,  
The Torrington Company Limited,  
Bedford, Quebec J0J 1R0

Professor John H. Howard,  
School of Business Administration,  
University of Western Ontario,  
London, Ontario.

PROGRAM

October 17

19:00 - 21:00      Cocktail reception for mission members,  
hosted by the Minister, Vice-Regal suite,  
Skyline Hotel, Ottawa

October 18

09:00              Mission departs from Ottawa by Air Canada charter

21:00              Mission arrives in Rio, where it is met by  
the Canadian Consul

October 19

Free in Rio. Tours may be arranged to  
points of interest in the area

October 20

12:00              Departure from Rio to Brasilia. On arrival,  
the mission will be officially received  
by Brazilian authorities and our Embassy.

16:30              Mission briefing at our Ambassador's residence

19:00              Barbecue at the Ambassador's residence  
for members of the mission

October 21

09:00              The Minister and the mission call on the  
Brazilian Minister of Industry and Commerce

10:00              The Brazilian Ministers of External Relations  
and of Industry and Commerce hold joint  
meeting with the Minister and the mission.

11:30              The Minister and the mission call on the  
Minister of Finance.

12:45              Luncheon hosted by the Brazilian Minister  
of Industry and Commerce.

15:30              The Minister and the mission call on  
President Geisel

October 21 (cont'd)

- 16:00 - 18:00     The Minister and selected members of the mission call on the Brazilian Ministers of Mines and Energy and of Transport. Canadian officials and other members of the mission call on the Minister of Air and Health and on Brazilian high officials of the Ministries of the Navy and Agriculture, and of Siderbras
- 19:30             Reception at Ambassador's residence for members of the mission and Brazilian officials
- 22:30             Departure for Sao Paulo

October 22

- 09:30             The Minister and party call on the Governor of the State of Sao Paulo. Signing ceremony for land acquisition of new site for Brasvacin. Members of the mission make individual business calls for balance of the day.
- 10:30             The Minister and party proceed to Embu for sod turning ceremonies at future Brasvacin site
- 11:30             Return to Governor's Palace
- 12:30             Luncheon hosted by the Brazil-Canada Chamber of Commerce. Keynote speech by the Minister
- 16:30             Informal debriefing with members of the mission
- 17:30             Briefing of Canadian press
- 19:30             Reception hosted by Canadian Consul

October 23

- 09:00             The Minister and party depart for a tour of the Alcan facilities  
Canadian officials and selected members of the mission fly to Curitiba, to visit COPEL installations  
Other members of the mission make individual business calls for balance of the day



October 23 (cont'd)

12:30 Luncheon hosted by the Companhia de Promocao de Exportacoes de Manufaturados do Estado de Sao Paulo - COPEME

19:00 Departure for Rio. Evening free

October 24

09:00 The Minister and selected members of the mission call on the Brazilian National Economic Development Bank. Other members of the mission make individual business calls for balance of the day

10:30 The Minister and selected members of the mission call on the President of Eletrobras and power authorities under Eletrobras

12:30 Luncheon hosted by Empresa Brasileira de Turismo - Embratur

15:00 The Minister and selected members of the mission meet with the President of CVRD (Companhia Vale do Rio Doce)

17:30 The Minister and party call on the Governor of the State of Guanabara and his Secretary of State for Science and Technology

18:30 Press conference

19:00 Reception hosted by the Confederacao Nacional da Industria - CNI

October 25

08:00 The Minister and selected members of the mission meet with General Araken de Oliveira, President of Petrobras

09:00 Canadian officials meet with high officials of Braspetro

09:30 The Minister and party depart for Brasilia for discussions with Brazilian Ministers

October 26

18:30 "Open house" at Canadian Consul's residence

October 27

17:00 Final meeting of the Minister with the  
mission  
Final debriefing

October 28

Departure from Rio to Ottawa

## MISSION REPORT

In Brasilia, the schedule of appointments took the mission to the President of Brazil and to key Ministers and high level officials. Brief summaries of the meetings are as follows:

President Geisel, in his private discussions with Mr. Gillespie, and then in his brief address to the entire mission, expressed his hope that a new era of Brazilian-Canadian relations would evolve from the mission. He emphasized the responsibility of both governments to open doors in trade and economic matters, and agreed with Mr. Gillespie's rejoinder that it was equally important to keep them open. President Geisel shared Mr. Gillespie's view that joint ventures would be a most important means for expanding economic relations.

Dr. Severo Gomes, Minister of Industry and Commerce, and Mr. Gillespie examined at length the possibilities for expanded trade, and recognized the substantial scope for a variety of approaches to achieve that objective, including merchandise trade and investments. Brazil is one of Canada's largest wheat customers and both Ministers hoped this important trade would continue.

At a joint meeting with Minister Gomes and the Minister of External Relations, Mr. Azeredo da Silveira, the three Ministers agreed that Canada and Brazil should cooperate in the forthcoming GATT multilateral trade negotiations, supporting the sector approach to ensure that world markets, particularly for upgraded resource products, were liberalized. There was agreement to encourage the exchange of official and private trade delegations, marketing missions and participation in trade fairs.

Mr. Mario Henrique Simonsen, Minister of Finance, gave the members an overall view of the current situation and outlook of the Brazilian economy, and discussed various mechanisms responsible for Brazil's outstanding economic performance. Of particular interest was the operation of, and the results obtained from indexation ie., the mechanism devised by the Brazilian government to neutralize inflationary distortions through adjustments in the value of securities, depreciation, taxes, etc., in accordance with the general

increase in prices. In the question period, Mr. Simonsen touched briefly on taxation, payments for technology transfers, remittance of profits, and repatriation of capital. He concurred that the Canadian performance in bidding on internationally financed projects was not in accordance with Canadian capabilities and urged Canada to become more closely involved and more aggressive in those activities.

Mr. Shigeaki Ueki, Minister of Mines and Energy, described the development plans in the sectors for which he is responsible. The discussion centered mainly around the vast expansion program of the electric power generation capacity and distribution network, and in particular on the Itaipu hydroelectric power development, to be built jointly by Brazil and Paraguay on the border between the two countries. The program will cost some 5 billion dollars.

Mr. Dirceu Nogueira, Minister of Transport, expressed warm welcome for Canadian participation in the Brazilian transportation programs. On October 18, the President of Brazil had announced a five-year railway development program to expand and modernize the country's present system. The program will require new investments of nearly \$5 billion in new equipment and track facilities, and the introduction of technological improvements and modern management methods. The growth of transportation methods has favoured highway hauling to the detriment of the railways. Twenty years ago, Brazilian railways transported about 30% of all cargo tonnage, while highways took about 40%. In 1973, the corresponding figures were 16% and 74%. The critical situation brought about by the large increases in the worldwide prices of petroleum, accelerated the move towards alternate modes of transport to facilitate the transfer of mineral and agricultural resources from the interior to the ports for export.

Dr. Paulo de Almeida Machado, Minister of Health, strongly supported the joint venture approach to vaccine production in Brazil. BRASVACIN, the Connaught Laboratories joint venture with the Sao Paulo State Government and the Federal Government, will produce human and veterinary vaccines in a facility near Sao Paulo. Mr. Gillespie and the Governor of Sao Paulo turned first sod at the future site of the facility in a brief ceremony which followed the signature of the land acquisition documents.



Senior officials at the Ministry of Aeronautics expressed great enthusiasm for the Buffalo aircraft. The Air Force is proud of the role which the Buffalo is playing in the development of the Amazon region, and of the many rescue and other missions performed by the aircraft. There are strong indications that additional aircraft are required, but Air Force budget limitations may delay procurement. Other suitable financing mechanisms could obviate this difficulty.

Senior officials at Siderurgia Brasileira S/A - Siderbras, the holding company for the government controlled steel enterprises, informed a group of mission members about a major expansion program for the 3 large companies under Siderbras control. They had provided the Brazilian Ministry of External Relations with a list of equipment requirements to be distributed to various Embassies. (After some delay, the list became available to the Department in Ottawa, and was promptly communicated to Canadian exporters for action.)

#### Sao Paulo

As indicated above, Mr. Gillespie participated in the signing ceremony for the acquisition of land on which Brasvacin will be built, and then proceeded to Embu, near Sao Paulo accompanied by the Governor of Sao Paulo State, to turn first sod at the facility's future site. (Mr. Gillespie held wide-ranging discussions with the Governor of the State of Sao Paulo, Mr. Laudo Natel and the Mayor of the City of Sao Paulo, Prof. Miguel Colasuonno, particularly on prospects for cooperation in the fields of urban transportation and development.)

The mission attended a luncheon-meeting of the Brazil-Canada Chamber of Commerce, at which Mr. Gillespie gave the keynote speech before some 250 senior Brazilian businessmen. A full schedule of business appointments had been prepared for the members of the mission, covering the two days stay in Sao Paulo. The main conclusions derived from those meetings are summarized elsewhere in this report.

## Rio de Janeiro

In Rio de Janeiro, Mr. Gillespie was welcomed by the Governor of the State of Guanabara, Mr. Antonio de Padua Chagas Freitas, and the Secretary of State for Science and Technology, Dr. Julio Coutinho. Meetings were held with various key organizations, as summarized below.

At the Banco Nacional de Desenvolvimento Economico - BNDE, its President, Dr. Marcos Pereira Vianna, provided Mr. Gillespie and members of the mission with thorough background on the objectives and operations of the Bank and the criteria applied in relation to financial assistance to Brazilian entrepreneurs. The Bank is a development institution which strongly supports basic industry, e.g., steel production; and to a lesser extent, public utilities and infrastructure programs, only to complement the support available through other government mechanisms.

BNDE will assist foreign entrepreneurs to establish joint venture operations in Brazil, supplying not only information and advice, but also equity capital if the foreign entrepreneur takes a minority participation. However, the Bank will not take control of the operations, as it refuses to become involved in day-to-day management.

Mr. Gillespie and mission members interested in the electric power generation sector, met with Mr. Mario Penna Bhering, President of Eletrobras, and several executives of Eletrobras, Furnas, CHESF, Eletrosul, Eletronorte, Itaipu, and CEPEL. Eletrobras is a holding company, owned by the Federal Government, and responsible for coordinating electric power production in Brazil. Mr. Bhering described the energy situation in Brazil, particularly the large, untapped hydroelectric power potential.

The Second Development Plan (1975-1979) allocates about 200 billion cruzeiros (some \$28 billion) for investment in the electric energy sector. A large part of those resources will be destined to hydroelectric power generation and transmission, but the plan also includes the expansion of Brazil's current nuclear capacity to a target of 3,000 MW. Total generating capacity which stood at 17,600 MW in 1974, is expected to reach 28,000 MW in 1979.

The Brazilian electrical sector has had close relations with Canadian capabilities for years. Mr. Bhering stressed the interest of the Brazilian authorities in continuing and expanding that relationship. Among the areas for cooperation, he mentioned high-voltage transmission technology, in which Brazilian development has received assistance from IREQ.

Canadian firms have expressed their interest in participating in the expansion projects in the electrical sector, particularly the Itaipu power development which is expected to cost \$3 billion, of which about \$1 billion will be spent to cover equipment needs. Mr. Bhering indicated that there are no plans to place equipment orders in one block, but rather bids will be called for portions of the project ranging in value up to \$200 million. The Brazilians are well aware of the Canadian capabilities in the field of large turbine-generator sets, and showed great interest in pursuing the possibilities of buying them from Canada.

Mr. Gillespie and members of the mission also met with the President of the Companhia Vale do Rio Doce - CVRD, Dr. Fernando Antonio Roquette Reis, and with top executives of the company. CVRD operations were described in a brief film, followed by more detailed discussion of several projects in which CVRD is currently engaged: phosphate for fertilizers, titanium, prospecting for non-ferrous metals, pulp and paper, etc. CVRD, in partnership with U.S. Steel, is developing the vast Carajas iron deposits in the State of Para; in association with Japanese interests, is building a 750 ton/day pulp mill.



## SUMMARY OF BUSINESS INTERVIEWS

### General Comments

Major opportunities exist in the area of industrial and commercial heating involving all types of process heating application. In the residential market there will be a switch from gas ranges and ovens to electric. Interest in joint ventures was shown by two electrical heating manufacturers in Sao Paulo. Follow-up includes their visit to Toronto in early 1975 for further discussions.

There is an opportunity to export specialized heating elements not manufactured in Brazil, incoloy, and stainless steel tubing.

Other possibilities include air conditioning components, low pressure valves and computer typesetting.

The nationalistic approach in Brazil is not to seek national control of the manufacturing sector but rather to increase local availability, regardless of the nationality of the controlling capital. Local availability is then protected by a high tariff structure and by regulations on the procurement of "national similars".

An exporter's position in the Brazilian market can be protected, and perhaps expanded, through the establishment of a local manufacturing facility. Brazilian regulations allow the supply of components e.g. from Canada, to the local facility, which need not cover a full product range and thereby opens the possibility to supply some finished items imported from the foreign partner.

It appears very likely that the major financial agencies, such as IBRD and IADB are no longer looking at Brazil as a developing nation. The volume of financing for Eletrobras is being reduced on a scale of approximately \$120 to \$40 million a year, with the expectation that the slack will be taken up by government and supplier financing.

The opportunities are enormous: transmission line for Itaipu, turbine-generator sets, supervisory control equipment, railway electrification.



The engineering requirements of Brazil are obviously staggering. Even if the technology exists in the country, it can hardly be available in sufficient quantity to keep pace with development. As an example, the rapid population and industrial growth of Belo Horizonte will place an impossible load on local services, such as water supply, sewerage, and transportation. Marketing of Canadian expertise will require a strong working relationship with local consultants.

The Banco Brascan de Investimentos S.A. would be interested in providing financing in Canadian dollars and Brazilian cruzeiros, for Brazilian clients of Canadian exporters of goods or services, i.e., in case of consultants, finance the fees. The Banco would also be interested in participating as an investment in new companies started in Brazil by Canadian firms, i.e., Brascan could be considered part of the "Brazilian content" in such a company.

### Livestock

There are opportunities for joint ventures since there appears to be a need for financing and for management expertise. Cattle sales without a financing offer are likely to be difficult.

Semen sales, particularly from Chianina performance tested bulls, are another possibility.

### Foodstuffs

Possibilities are real and exciting but can only be exploited after a great deal of investigation beyond that which was possible during the mission. The possibilities are summarized as follows:

- 1) joint venture in oil seed crushing, with an existing processor;
- 2) joint venture in oil processing, packaging, and marketing, to extend an on-going company into the consumer product market;
- 3) immediate requirement for two oil deodorizers and three more over the next two or three years, with two different companies;
- 4) a possible master franchise for Guarana soft drink in Canada.

## Fisheries

Brazil has been for many years and continues to be a substantial market for salted codfish. Its main sources of supply are the Scandinavian countries, principally Norway and Iceland for Southern Brazil, and Spain and Canada to a lesser extent for Northern Brazil. Canada can regain a larger part of the Southern Brazil market for salted cod if supplies at the sources were to improve.

There appears to be a great potential for a joint venture involving the supply of Canadian technology, processing machinery, and capital for modern refrigerated warehousing.

The fish processing industry needs consolidation and specialization in order to realize its potential. Some operations are reportedly running efficiently, for example, shell fish processors in the North. Lobster processing, on the other hand, is predicated on the production and sale of frozen lobster tails, which wastes two-thirds of a very marketable fish.

There is an excellent opportunity to sell modern, efficient process equipment together with engineering, to the Brazilian fishing industry.

## Forest Industries

Half of the forest area of South America (i.e. 350 million hectares) is located in Brazil. Sawn wood production in 1973 was nearly 4 million cubic meters, a very small proportion of the potential forest harvest, as utilization is difficult because of overcutting in the South, abundance (1500) of species, and lack of infrastructure in the North. Government priorities for the sector have not been high in the past; this is now likely to change.

A redressing of the situation could open ample opportunities for Canadian sawmill machinery estimated at \$15 million per year over the next decade. Marketing this machinery in Brazil will require the offer of financing for large sawmill packages.

There will also follow a need for consulting services, and the possibility of joint ventures.

## Electric Power Sector

Brazil will place increased emphasis on the development of hydroelectric power generation. At present, 22 plants are in progress totalling 15.6 MW; 34 plants will be built in the next 10 years requiring 180 turbine-generator sets (worth about \$1 billion). As a result, the present installed capacity of 18,000 MW, will be doubled. Development goals call for 28,000 MW in 1979 and 70,000 MW in 1990.

Brazil already builds its own power generation equipment in joint ventures with Canada (Dominion-CGE), Austria (Voith), France (Nierpis), Japan (Hitachi-Mitsubishi), and others. Local production is promoted by incentives such as decreasing interest rates on domestic financing of equipment with increasing local content.

Canada has a well-recognized expertise to manufacture very large, sometimes site-assembled machines, but it will be necessary to complement it with appropriate financing.

Eletrobras recognized that the Canadian power generation equipment is well liked in Brazil, particularly the capability demonstrated at Grand Coulee. The Itaipu program calls for 18 turbine-generator sets, to be installed at the rate of three per year with the first unit on line in 1983. This is estimated to require possibly two groups of manufacturers.

Canada is extremely well positioned to make a very significant contribution to the application of high-voltage transmission technology in Brazil. Our technological expertise is demonstrated by IREQ (one of the most advanced high-power research facilities in the world), Churchill Falls (one of the few high-voltage, high-power transmission facilities in successful operation in the world), Eel River (the first solid-state HVDC inter-tie system in the world).

In electric power transmission at 138 KV and below, the opportunities for Canada are currently restricted to a few specialized fields, e.g., network protectors, relays, HV cables, lightning arrestors at higher voltage.

Canada should present a united front in international competition for projects of the magnitude of, say, Itaipu. In particular, we should limit the competition between Canadian consultants for a given project.



## Mining

The expansion of the mining and associated industries should represent an important opportunity for Canada, but some of the sales effort will have to be made in Japan, Italy, and the U.S.A., Brazil's partners in the development of those resources.

Canadian consultants do not appear to be very heavily involved in Brazilian mining. There seems to be a market for off-highway vehicles in mining and dam construction; it would probably require entering into joint ventures for local manufacture.

## Steel Industry

The three major steel companies (C.S.N., Usiminas, and COSIPA) have established expansion programs which will require a considerable volume of equipment in the next 5 to 10 years. Domestic manufacturing capability could limit the opportunities for Canadian manufacturers to the supply of very specialized equipment, unless financing can tie the sourcing to Canadian suppliers. A similar situation prevails in the field of paper machinery.

The Brazilian steel industry plans to expand production capacity from 7.1 million tons in 1973 to 22.5 million tons in 1980. Currently, expansion programs at CSN, Usiminas, and COSIPA include the addition of 400 thousand tons capacity to the flat rolled production, which should be completed by the end of 1974. The next phase of the expansion program is already underway and is slated for completion by the end of 1976. It will increase Brazil's installed flat rolling capacity to 7.2 million tons. All engineering, contracting, equipment supply, and financing for this phase, have been completed.

The third phase of the flat rolled expansion program will add a further 4.4 million tons of installed capacity, at an anticipated cost of \$1.3 billion.

A 2 million ton plant to produce shapes is scheduled to begin production in the third quarter of 1978, according to current plans, and will cost \$800 million. In spite of this, Brazil expects a shortage of 2.8 million tons of shapes products by 1980.



In addition, a new slabs and blooms plant with a capacity to roll 3 million tons in the first phase, is now under consideration at Tubarao. One third will be for domestic consumption and two thirds for export equally to Japan and Italy. A second project is a 4 million ton plant to manufacture semifinished products at Itaquí. The feasibility study is expected to be completed in March 1975.

There is great interest in Canadian technology, engineering, and equipment, but the overriding consideration seems to be financing, closely followed by excellence in technology. Opportunities in the latter field could mean \$5 million of technology sales in the third steel expansion phase. Further opportunities could develop if Brazil decides to produce spiral-welded pipe, and to employ direct reduction processes for iron ore.

### Railways

The stated policy of the Brazilian government is to very substantially improve the rail system, under a \$4.5 billion investment plan for the next five years. This opens a major market opportunity for Canadian railway engineering expertise, which is lacking in Brazil. Opportunities lie in specialized fields, such as design of maintenance facilities, signal and communications systems, and electrification. The need to work with local Brazilian firms is emphasized since they have a clearer understanding of the political situation.

Opportunities for the sale of railway products are excellent, particularly rails and locomotives.

### Motor Vehicles

The automotive industry is projecting production levels of 1.7 to 2.0 million units in 1980. Torrington has decided to expand its Brazilian manufacturing facility to include the production of bearings for the auto and farm machinery industries by January 1976.

### Electronics

Market potential for video tape cleaning and evaluating equipment is good. The need for an ocean data monitoring system for Brazilian coastal waters was identified in a preliminary way. Further investigation is required to establish the most appropriate marketing approach.

Considerable evidence was found which indicated the strong need for high-frequency equipment and the opportunities for sales by Hermes.

The Ministry of Aeronautics appeared to have limited interest in flight simulators but substantial interest in A.T.C.

#### Some Specific Arrangements Made

Agreement was tentatively reached between P.D.G. and ASTEL, a local firm which specializes in regional developments, to form an ad-hoc association to pursue the tourism and infrastructure study in N.E. Brazil. A member of the P.D.G., Associates Engineering Service Ltd., agreed with PROMON to pursue and execute the water and sewerage program in Belo Horizonte.

Reago, S.A., a subsidiary of the Camargo Group (construction and highway building), presented a letter of intent to Spiroll to obtain a licensing agreement to use Spiroll Corefloor systems. Other business opportunities in the construction industry for Spiroll equipment and systems, were identified for follow-up as appropriate.

### IN CONCLUSION

The mission was a most successful event, as it achieved all of its objectives, particularly the establishment of high level contacts with Brazil's decision makers. Canada's interest in participating in the future development of the Brazilian economy was strongly demonstrated to the key executives in government and business.

The members of the mission were exposed to the current thinking that guides economic activities in Brazil, as well as to the leaders charged with its implementation. The pragmatism with which Brazilians conduct the business of governing and managing requires that kind of exposure, on a personal one-to-one basis. The distance which separates Canada and Brazil, the approach to doing business, the language, are all barriers which can be dealt with. The Brazilians are now more familiar with Canadian capabilities. They need them and will gladly welcome them, provided they meet Brazilian priorities. In the changing world of today, priorities are likely to change also, so that strong marketing and patient groundwork are basic ingredients in any program to penetrate that challenging market.

It will take some time to evaluate fully the trade promotional impact of the mission, although some mission members successfully completed sales of machinery and equipment, since its objectives were aimed at the medium and longer term expansion of Canadian-Brazilian trade and economic relations. This is particularly true of the discussions which mission members had with prospective Brazilian partners, regarding joint venture possibilities.

Nevertheless, the mission did identify a potential new trade of \$300 million in the short term, apart from the numerous opportunities presented by the Second Development Plan, and other programs in the public and private sectors.

The magnitude of the Brazilian market, as measured by its import appetite, even after exclusion of petroleum imports, and by its ambitious development plans, attracts suppliers of goods and services from every major country. As a result, competition is keen and aggressive, in a market steered by competent executives, who are by and large veterans at the negotiating table. This is undoubtedly the main challenge facing Canadian suppliers; Canadians have met it in the past and are increasingly meeting it today, but



renewed efforts will have to be spent to meet it in the years to come. Effective marketing strategies will have to take full account not only of current market conditions, but most importantly they will have to assess future alternatives dictated by the unceasing expansion and diversification of the economy, the constraints imposed by the changing world situation, and the pragmatic response of Brazil's government and business leaders.

Financing and managerial skills will continue to be in short supply in Brazil, so that foreign contributions in these areas will continue to be welcome, under terms and conditions acceptable to Brazil. Joint ventures are likely to play an increasingly important role in this respect, particularly in the manufacturing sector, since as a mission member put it, "if a manufacturing base is established in Brazil a prevailing export position can be protected and even expanded".

The foregoing conclusions underline the need for an effective follow up program. The Department of Industry, Trade and Commerce has prepared a basic program, in accordance with the results of the mission, but the main driving force must be supplied by the private sector, making full use of the experience gained by the mission members.



### FOLLOW UP

The Department of Industry, Trade and Commerce assists the marketing efforts of Canadian exporters in several ways. The Fairs and Missions program provides support for Canadian presence in specialized trade fairs around the world. As an example, such support was given to Canadian companies attending a machinery exhibition and a livestock show in Brazil in 1974. The program for 1975 is not yet firm and may consequently respond to last minute requirements as appropriate.

The growing interest shown by Canadian exporters in the Brazilian market often generates the need to bring prospective buyers to Canada for a first hand assessment of our capabilities. The Department will continue to support those programs.

Another promotional instrument which is attracting increasing attention, is the technical seminar approach. It involves technical discussions among members of a specialized segment of an industry. One such seminar, in the field of high voltage transmission, is planned for April, 1975, in Rio de Janeiro.

The possibilities uncovered during the mission, in the field of joint ventures, are most interesting, but will require careful consideration, investigation, and follow up. The Department is gearing up to meet this new challenge and offer adequate assistance to Canadian companies interested in pursuing this approach. Several mission members are currently discussing, with prospective partners in Brazil, possibilities in the fields of foodstuffs, machinery and equipment, and engineering services, among others.

Members of the mission are also actively following up on sales opportunities which could lead to sales of about 4 million dollars in the Sao Paulo area alone. The potential sales volume opened by the mission has been conservatively estimated at \$300 million, although substantial Canadian participation in any one of Brazil's multi-billion dollar programs (steel, railways, hydroelectric power) could easily increase that figure.

Eleven Trade Commissioners now posted to Latin American countries, will visit Canada in April 1975, and participate in a series of seminars which will take them from Vancouver to Halifax. The Commercial Secretary in Rio de Janeiro will thus have the opportunity to discuss the status of any follow up action taken since the mission returned to Canada.

ANNEXES

The Trade Commissioners in Brasilia, Sao Paulo, and Rio de Janeiro, have prepared the attached brief reports on key areas of the Brazilian economy, which are the subject of development plans. They are included in this report to highlight their importance both to the domestic economy and as fertile areas for Canadian exporters to pursue business opportunities.

ASSISTANCE TO CANADIAN EXPORTERS

For additional information and possible assistance, Canadian companies interested in the Brazilian market should contact:

Latin America Division,  
Western Hemisphere Bureau,  
Department of Industry, Trade and Commerce,  
Place de Ville,  
Tower "B",  
112 Kent St.,  
Ottawa K1A 0H5

Tel: (613) 996-5546

or

Commercial Secretary,  
Canadian Embassy,  
Caixa Postal 07-0961,  
SDS-Edificio Venacio IV, cobertura,  
70000 Brasilia DF, Brazil

Tel: 23 7515

Consul and Trade Commissioner,  
Canadian Consulate,  
Caixa Postal 2164-ZC-00,  
Edificio Metropol,  
Avenida Presidente Wilson 165,  
Rio de Janeiro, Brazil.

Tel: 242-4140

Consul and Trade Commissioner,  
Canadian Consulate,  
Caixa Postal 6034,  
Edificio Scarpa,  
Avenida Paulista, 1765, 9 andar,  
Sao Paulo, Brazil.

Tel: 287-2122

IN MEMORIAM

Mr. F.J.E. Lockhart who accompanied Mr. Gillespie in this mission, contributing to it his enthusiasm and dynamism, and making new friends among the Canadians and Brazilians who met him, died suddenly in Toronto, on November 13, 1974.



- 32 -

BRAZIL PREPARES MASSIVE  
RAILWAY DEVELOPMENT PROGRAM

W.L. Clarke,  
Commercial Secretary,  
Brasilia.

The President of Brazil announced on October 18 an important five-year Railway Development Program which calls for new investments of nearly \$5 billion aimed at remodelling and developing Brazil's outdated and inefficient railway system. During the recent Canadian Ministerial Mission, the Brazilian Minister of Transport told the Canadian Minister of Industry, Trade and Commerce, the Honourable Alastair Gillespie, that Canadian participation in this program would be warmly welcomed. Canadian engineering firms are already engaged on a number of major railway projects in this country and future prospects for increased Canadian presence are bright. Besides consulting services, there would appear to be good potential for Canadian exporters to supply railway communications equipment, traffic control systems, freight cars, special gondolas for carrying ore, steel rail, ties and possibly locomotives.

In order to understand the present status of the Brazilian railway system, several factors should be noted. The system arose out of a consolidation of a number of small, privately-owned railways built near the end of the 19th Century. Most of these were designed to haul coffee and other agricultural products to export ports and were constructed on narrow one-meter gauge. Brazil's principal ports are cut off from the rest of the country by the "Serra do Mar" mountain range. Although this natural barrier produced some rather remarkable engineering feats, it gave rise to very poor operating conditions for the railways. After the Second World War there was a surge of highway construction throughout Brazil. The automobile and truck industries developed rapidly and reliable door-to-door road transportation soon almost squeezed the uncompetitive railway system out of business. As a result, the railways piled up large financial losses and new investments in plant and the introduction of modern railway techniques were not implemented. The recent petroleum crisis has changed the picture and the Brazilian authorities now realize

the importance of developing a healthy railway system for both freight and passenger transportation. This has been reinforced by Brazil's need for reliable and competitive modes of transport to move its rich mineral and agricultural resources to overseas markets. For a concise view of the present state of the Brazilian railway system, please refer to the four tables included in this report.

Basically the new Program aims to tackle the present problems in two interdependent ways:

- (a) by technological improvements and the introduction of modern management methods;
- (b) by huge investments in new equipment and track facilities.

As a first step in this direction, the Federal Railway System (RFFSA) has created a subsidiary called "ENGEFER - Empresa de Engenharia Ferroviaria SA" (Railway Engineering Corp.) which will be responsible for feasibility and engineering studies and the supervision of construction work which in the main are to be carried out by private enterprise, leaving the present administration free to concentrate on improving operational and administrative procedures. It is hoped that this will eventually result in a 7% cut in the number of employees and that retraining programs, both in Brazil and abroad, will produce more efficient personnel to offset this reduction in workers. Sharp growth in operating revenues is expected from improved container and piggy-back transportation and from a more aggressive sales policy aimed at shippers of general freight cargo.

The technical improvement plan stresses the necessity of introducing such modern innovations as continuously welded rail butts, mechanical road-bed maintenance methods, centralized and automatic traffic control systems, and the use of a VHF radio system for fast and reliable communications.

The investment program is divided into 14 sub-programs and 70 individual projects, that together will account for expenditures of \$4.2 billion. Some of its more important aims are:

- (a) construction of 2,360 miles of new lines;
- (b) improvement of 6,700 miles of existing, but outdated track;

- (c) either widening of 2,000 miles of 1 meter gauge track to 1.60 meter gauge or the addition of a third rail for the same purpose;
- (d) electrification of 900 miles of track;
- (e) acquisition of 298 locomotives, 20,000 freight cars, 70 integrated train-units, 3,175 iron ore gondolas, and 140 passenger cars. (These estimates may be increased as government planners are now considering that up to 1,200 new locomotives and 84,000 freight cars might eventually be needed);
- (f) laying of 1.5 million metric tons of new rail track.

The subprogram in support of Brazil's steel expansion plan is the most important one in the Program and accounts for 35.6% of the total budget. It envisages a new 400 mile line between Belo Horizonte and Sao Paulo, with a 130 mile branch to the CSN steel mill at Volta Redonda. The attached map shows the importance of this new line; not only will it take some of the burden off the present track between Belo Horizonte and Rio de Janeiro (particularly a large portion of the iron ore intended for domestic consumption) but the emergence of Belo Horizonte as a new industrial centre makes a direct connection between that city and Sao Paulo essential.

Improvements to the old Rio-Belo Horizonte and Belo Horizonte-Vitoria lines are high priority items in the Program. The Rio-Sao Paulo connection (225 miles) will also be revamped in order to allow greater train speeds.

Other major improvements will be carried out mainly in the South, especially in the States of Parana and Rio Grande do Sul, where a total of 895 miles of new track will facilitate the movement of soybeans, coffee and corn exports to the ports of Paranagua and Rio Grande. In Brazil's central region the branch to Brasilia will be improved and the country's only North-South connection, between Salvador and Belo Horizonte, which runs through the developing Sao Francisco River Valley, will be modernized and will include the addition of a line from Salvador to Maceio in the north.



Although generally oriented towards the improvement of the railway system's bulk cargo carrying capacities, the Program also calls for substantial improvements to the sub-urban commuter services in Rio de Janeiro and Sao Paulo. These may prove to be the most difficult projects since both cities are hemmed in by urban development and new track can only be added by very costly redevelopment schemes. The Program recommends the appointment of consulting engineers to study the problems and come up with possible solutions.

Of the total amount budgeted for the Program, approximately \$3.9 billion is expected to be spent by 1979. About \$1.4 billion of this amount will be raised by taxes, improved operating revenues, and the normal budgets set aside for the railway system by the Ministry of Transportation. The Program plans to raise \$2.5 billion from commercial financing of which \$1.2 billion is expected to come from foreign sources.

In principle, the Brazilian authorities will give priority to purchasing their requirements from Brazilian companies. This applies both to the acquisition of equipment and know-how. In practice this means that the Government, instead of turning directly to a foreign company for its needs, prefers to award a contract to a Brazilian firm, with the tacit understanding that the Brazilian firm might subcontract or joint venture with a foreign company to help meet the terms of the contract. Therefore, Canadian firms interested in bidding on contracts arising from this Program should be prepared to work with Brazilian firms.

According to officials at the Brazilian Ministry of Transportation, the following areas will require foreign input:

- (a) electrification
- (b) signalization
- (c) communications
- (d) centralized and automatic traffic control systems

In addition, foreign suppliers will likely have opportunities for sales where the local industry cannot meet the huge projected demand for such products as rail ties, rolling stock and steel rails.



Foreign suppliers may be given preference in those projects financed by foreign loans as these are very often tied to the condition that some of the hardware be bought in the loaning country. The Brazilian Ministry of Transportation has already received proposals in this connection from West Germany, Japan and Italy. The Brazilian authorities indicated, however, that foreign "turn-key" project offers will not be encouraged for any of the projects in the new program.

Canadian firms interested in participating in the Brazilian Program should register as soon as possible their capabilities and experience with the following three organizations charged with implementation of the various projects:

Rede Ferroviaria Federal S.A. (Federal Railway System)  
praca Duque de Caxias 86 - 14º andar  
20000 Rio de Janeiro - GB  
President: General Milton Mendes Goncalves

Ferrovias Paulistas S.A. (State of Sao Paulo  
Railway System)  
rue Libero Badaro, 39  
Sao Paulo  
President: General Jau Pires Castro

Engefer - Engenharia Ferroviaria S.A.  
Palacio dos Transportes  
praca 15 de Novembro  
20000 - Rio de Janeiro - GB  
President: Engenheiro Daniel Milaso

Copies of correspondence should be sent to the Canadian Embassy in Brasilia and the Canadian Consulates in Rio de Janeiro and Sao Paulo for follow-up purposes.

PRESENT STATE OF BRAZILIAN RAILWAY SYSTEM

Table 1 - Modes of Cargo Transportation

	<u>Railway</u>	<u>Highway</u>	<u>Other</u>
1954	29%	38%	33%
1973	16.2%	74%	9.8%

Table 2 - Operating Track and Gauges (1973)

<u>Gauge</u>	<u>Miles</u>	<u>Percent</u>
1.60 m	2,060	10.9
1.435 m	120	.6
1.00 m	16,585	87.8
.76 m	<u>125</u>	<u>.7</u>
Total	18,890*	100

Note: Of this total, 1360 miles are electrified.

Table 3 - Available Rolling Stock (1973)

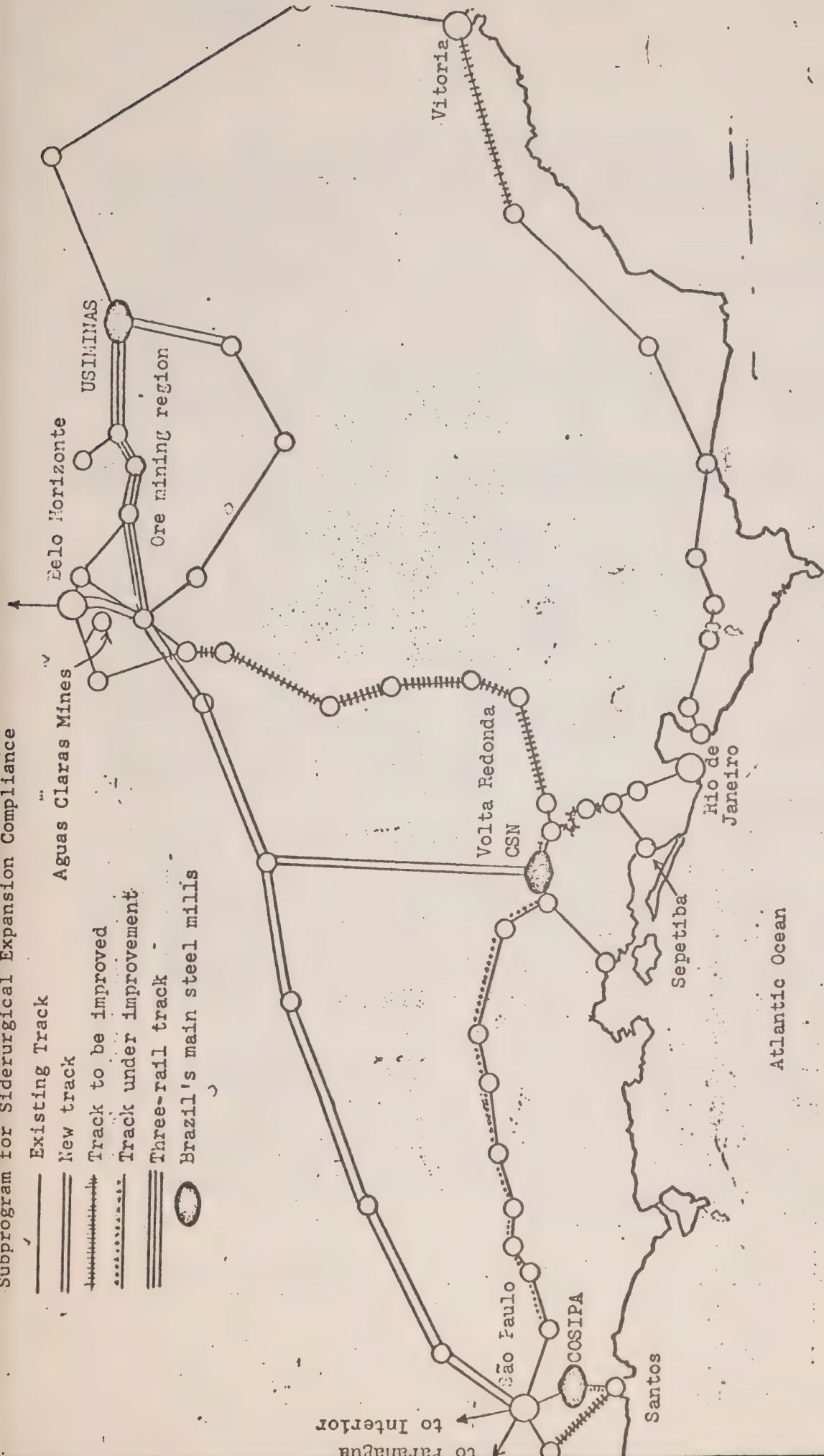
Locomotives	2,059
Freight cars (all kinds)	56,089
Integrated Train Units	379
Self-propelled Cars	69
Passenger Cars	3,920

Table 4 - Present and expected demand for transportation  
by rail, classified by principal commodities

	Millions of tons			
	<u>1973</u>	<u>%</u>	<u>1980</u>	<u>%</u>
Iron ore	45	55.6	149	58.2
Agricultural Products	6	7.4	24	9.4
Cement	4	4.9	15	5.9
Coal	3	3.7	7	2.7
Petroleum Derivatives	4	4.9	10	3.9
Sugar	4	4.9	7	2.7
Siderurgical Products and Pig Iron	2	2.5	9	3.5
Fertilizers	2	2.5	13	5.1
Others	<u>11</u>	13.6	<u>22</u>	8.6
	81		256	

Note: 74.6% of this total is at present being transported in Brazil's central region, by 1980 this figure is expected to reach 80%.

BRAZILIAN RAILWAY DEVELOPMENT PROGRAM  
 Subprogram for Siderurgical Expansion Compliance





- 40 -

## MINING INDUSTRY IN BRAZIL

Roger B. Blake,  
Consul and Trade  
Commissioner,  
Rio de Janeiro.

The phenomenal growth rate that Brazil has experienced over the last six years (more than 10% per year) has caught the attention of the world's investors. A stable government and favourable investment laws have created a climate of confidence for foreign capital. One of the areas that is being examined both by foreign companies as well as the Brazilian government, is the mining industry. Over the next four years more than U.S.\$4 billion will be invested in a dozen major projects, which, when combined with smaller ones, will require over \$1 billion in imported equipment for the mining and ore processing sector. The purpose of this article is to outline developments in the mining industry and highlight some of the major projects, as well as the type of equipment needed.

Accounting for less than 2% of the GNP, mineral production can count only two minerals in the country's twenty top exports. These were iron ore and manganese, whose total exports were U.S.\$382 million in 1973. Brazil is considered to possess an abundance of 22 principal minerals used in the country; to have a sufficient reserve of 14 others and to be in short supply of another 14.

Brazil is, and will continue to be, principally an iron ore producer, with manganese a distant second. Bauxite, with recently discovered ore body deposits, is being developed rapidly. The area that holds the most promise for the future is the base metals, particularly tin, nickel, zinc and copper. Brazil is already the world's leading producer of columbite/pyrochlore and beryl.

Only a small portion of the equipment used in large mining operations is manufactured in Brazil. Opportunities exist in the following areas: mobile mining equipment, agglomeration, materials handling, transportation and communications. Imports of both goods and services will play a large part in the development of Brazil's mining industry in the years to come.

There are no plans at the moment for Brazilian companies to produce the large dump trucks, blast hole drill rigs, shovels, tractors, front-end loaders, concentrates, stackers, reclaimers, pelletizing equipment, etc.

Domestic firms are involved in the manufacturing of the small, and in some cases, intermediate sizes of this equipment but generally speaking, the market for the bigger mining equipment would not justify the required capital investment for domestic manufacturing. At the moment Brazil manufactures a variety of crushers, screeners, grinders, feeders and conveyors.

What are some of the larger projects and the equipment needed?

#### Carajas Iron Ore Project

As mentioned previously, iron ore dominates the Brazilian scene and it is in this area where the principal expansion is being undertaken. Some estimates put Brazil's reserves above those of any other country in the world - in the neighbourhood of 20 billion tons. By far the largest new mining project is the \$1.5 billion Carajas Iron Ore Project, involving a mine in the state of Para, and a 1,000 km railway line to the new port of Itaqui in Maranhao. At least \$225 million is expected to be spent on imported capital goods for the complex.

Carajas is a partnership between Companhia Vale do Rio Doce (CVRD)\* (51%) and a Brazilian subsidiary of U.S. Steel - Companhia Meridional de Mineracao (49%). The name given to the company is Amazonia Mineracao S.A. Production is scheduled to commence in 1978 with an initial annual output of 11.5 million tons, reaching approximately 44 million tons annually by 1984. Reserves at Carajas are 1.7 billion tons measured, 2.5 billion tons indicated and 11.5 billion tons probable. Average iron content is 67-68%.

Advanced engineering has already been done on the port and the railway lines. Both of these projects are being designed by Canadian engineering companies.

...42

\*See resume of CVRD

The following is a breakdown of the type of equipment needed for the Carajas complex, bearing in mind that construction will take 3 years to complete and that the mine will take another 7 years to reach capacity.

a) Railway

Total equipment needs for the 1,000 km line are forecast at \$310 million, of which \$50 million would be for construction equipment; \$150 million for rolling stock, locomotives and maintenance-of-way equipment; \$80 million for rails and \$30 million for support equipment.

i) Construction Equipment

The most costly job of the Carajas project will be the clearance of the right-of-way for the railway line. This will involve up to 75 crawler tractors plus a fleet of compactors, scrapers, rollers, etc. Some of the equipment will be available locally but Amazonia may decide to buy units for use by the various contractors on the job to speed up the work.

ii) Rolling Stock

About 4,000 92 metric ton railway wagons and 50 diesel locomotives (3,200-3,600 HP) will be ordered. Brazil already can produce railway cars and may be able to manufacture some of the locomotives itself. (Consideration is being given to electrifying the line instead of using diesel, in view of the high cost of fuel.) However, a \$4 billion railway expansion program announced by the government a few months ago will certainly strain the domestic manufacturers' capacity and will, in all probability, necessitate the importing of a substantial amount of equipment.

iii) Rails

The line will be a single track (1.60 meter gauge), 136 pound/yard rail. So far rails of this size are not manufactured in Brazil and in all likelihood will not be available in time for the Carajas project.



iv) Maintenance of Way

Maintenance of way equipment amounting to \$15 million will be almost entirely purchased abroad and includes tie-tamping, tie setting and ballast laying equipment.

b) Port Terminal

Ponta da Madeira (Itaqui) port is expected to cost approximately \$165 million and will be able to accommodate ships up to 350,000 dwt.

i) Piling

Sheet piling for the dock area will probably be imported, although the amount is not yet known.

ii) Materials Handling

Most of this equipment will be imported. Projected costs are \$7 million for four stackers and two reclaimers and \$6 million for two shiploaders. More than 60,000 ft of conveyors and feeding equipment will be needed, the bulk of which domestic manufacturers will be able to supply.

iii) Tugs, launches, crewboats and marine equipment will probably have to be imported and are expected to cost approximately \$5 million.

iv) Crushing

\$20 million of crushing and screening installations will be located at the port site. The \$3 million of secondary and tertiary crushing equipment will probably be purchased from local manufacturers, although some of the \$5 million of large screens and dryers may have to be imported. Ore will be crushed to six inches at the mine and 3/8" at the port.



SIDERBRAS, the government-owned steel holding company, and Japan's Nippon Steel Company, are planning to install a \$1 billion steel mill at Itaquí. Initial output would be 4 million tons of semi-finished products in 1980.

c) Mine

\$25 million worth of imported equipment will be needed at the mine site itself. It consists of:

- 8 12 to 14 yd power shovels
- 28 150 ton electric wheel trucks
- 7 large graders
- 7 large crawler tractors
- 4 large rubber tire tractors
- primary crushers for 6 inch crushing
- 7,000 ft of conveyors and feeding equipment (possibly supplied by local firms)

In addition, Carajas will require about \$2 million of imported laboratory equipment. Imported communications equipment will probably be about \$6 million, consisting of antennas, transmitting and receiving equipment, towers, telex hardware.

SAMITRI/SAMARCO

SAMITRI-S.A. Mineracao da Trindade is Brazil's third largest iron ore producer. Their four mines in Minas Gerais produce 6.5 million tons of ore a year and will be increased to 10 million tons by 1976 after the completion of their Alegria mine. Eventually the \$26 million three-stage Alegria expansion will raise Samitri's total annual production to 20 million tons.

In addition, Samitri is engaged in a 51/49% joint venture with Marcana International S.A. on a \$353 million iron ore project involving mining, beneficiation, transportation by pipeline and pelletizing of concentrates for exports. Headquarters of Samitri are in Belo Horizonte.

### MBR-Mineracoes Brasileiras Reunidas

MBR is owned by an Antunes-controlled holding company (51%) and the St. John Del Rey Mining Company (49%), which is controlled by Hanna Mining Company. This year total production from MBR's mines will exceed 13 million tons, of which 10 million tons will come from the Aguas Claras mines in Belo Horizonte. By 1978 MBR's production is expected to be 19 million tons. By that time one or two pelletizing plants may be installed, with investment (for one plant only) in the order of \$100 million. The capacity will be approximately 3 million tons and the Dravo-Luigi process will be used. Approximately one quarter of the cost will be for imported equipment. Over the next 4 years MBR plans to spend about US\$3 million for mining equipment, including the purchase of a dozen 35-50 ton trucks, several front end loaders and four or five large size tractors.

### CSN - Companhia Siderurgica Nacional

The government owned Companhia Siderurgica Nacional, is Brazil's largest steel producer. It has its own mine in Minas Gerais producing 3 million tons annually. Planned output in 1978 is 7 million tons, with a total investment of \$60 million, of which \$45 million will be spent on equipment (half of which will be imported) including power shovels of 6-8 yards capacity, and 35-50 tons capacity off-highway trucks.

### Trombetas Project

With predictions that by 1980 Brazil may be producing 5 million tons of bauxite, 2 million tons of alumina and 700,000 tons of primary aluminum, it is no wonder that Brazil is proceeding at full speed to develop the Trombetas Project, with participation by Mineracao Rio Norte, 51% Brazilian (CVRD) and two aluminum companies and 49% foreign (Alcan and 7 other companies).

The mine is located in the state of Para near the junction of the Amazon and Trombetas Rivers. A 30 km railway will transport the ore to a port on the Trombetas River which will accommodate ships of up to 50,000 dwt.

A total investment of approximately \$120 million, of which \$15 million has been allocated for imported equipment, such as:

- 3 mobile drills
- 4 3,000 kw diesel generators
- 1 large primary crusher
- 1 ship loader
- 2 portable reclaimers
- 1 one yard dragline

### Exploration

Brazil's mining growth has been a direct result of the amount of effort that has been channelled into exploration. This pace is now being stepped up. Nowhere is this more prevalent than in the vast Amazon basin where CPRM\*, the government-owned mineral exploration company, together with private companies, has 250 geologists exploring the area. But the work in this part of the world is difficult and expensive.

During the past few years, two major projects have been carried out under the auspices of DNPM, the federal government Mines Department. Projeto RADAM has completed coverage of approximately 4-6 million square kilometers of the Amazon. A German group working with CPRM carried out an aerial survey of approximately 562,000 sq. kilometers in Minas Gerais.

A third significant resource survey is now under way, partly financed by CIDA funds: the Goiás Project. This is a Cdn\$4.4 million loan from the Inter-American Development Bank for exploration of a 377,000 sq. kilometer area of parts of the states of Goiás, Mato Grosso and Pará. Total cost of project is estimated at \$11.2 million. Canadian consultants will be advising DNPM on this project and some equipment will be purchased in Canada. The survey interpretation and preparation of project reports will be carried out by the Geological Survey of Canada and will be financed by CIDA.

\*See resume on CPRM



## Approach to the Market

This section is best divided up into two parts:

- a) Consulting Services
- b) Equipment Supplies

although much of the advice applies to both groups.

### A) Consulting Services

As mentioned previously, two Canadian consulting consortia have already won big contracts on the Carajas Iron Ore Project. In both cases, they have joined forces with a Brazilian firm. An association with a local firm or a contract with CPRM itself are necessary in order to work in Brazil. Local talent is improving and this, coupled with legislation in favour of the Brazilian consultants, will make it tough going for Canadians. To keep up to date on the Brazilian mining scene, close contact should be maintained with Canadian mining companies, many of whom have offices in Brazil.

Brazilian legislation requires any foreign company providing technical or consulting services to form an association with a local company, or to have a service contract directly with CPRM. In addition, Brazilian firms are given an advantage in competition with foreign firms. This fact, coupled with the rapidly improving local talent, will hinder the entry of Canadian firms in the consulting market. Nevertheless, the success of Canadian firms competing internationally for the Carajas project indicates that market entry is possible.

The market for surface and aerial geophysical survey services is growing. There are currently seven Brazilian firms capable of performing aerial geophysical surveys. If a Canadian firm is to enter this market, it will have to open an office in Brazil, and associate with one of these local companies. Security regulations prohibit the use of foreign pilots in carrying out geophysical surveys. Much of the aerial surveying is performed under contract with CPRM, which invited tenders from local firms. If the survey is sufficiently complex, the local firm may retain a foreign firm to assist in the survey on a contract basis. Such contracts are registered with the Central Bank, and payment for services is straightforward.



## B) Equipment Supplies

Suppliers of land and airborne geophysical equipment face a dilemma in this market. Mining companies generally do not want to purchase equipment, but prefer to contract to have the survey carried out. The contractors themselves feel that with the wide range of equipment in use, to purchase instruments for a particular project may result in only using the equipment once or twice. A rental or lease scheme is more attractive but the equipment can only be imported duty-free for specific contracts. In spite of this, sales of Canadian equipment are increasing. Canadian geophysical equipment is well known in Brazil and is well respected. As an example, Canadian equipment is in use at the University of Bahia (among others) and has been used by German firms when they performed a survey of Minas Gerais.

Canadian drilling equipment manufacturers have been reasonably successful in the sale of their products to Brazil. Most of the mining in Brazil is open pit, although some coal, gold and new potash deposits may require underground mining equipment.

The best way for an equipment manufacturer to enter the market is through the services of a good agent. Good agents are available but due to the limited market, various government incentives, turnkey operations involving purchase for a whole project, financing difficulties etc., few are anxious to take on lines of specialized mine equipment unless, of course, a project is immediately viable. As important, however, is the presence of a service function. Although many large mining companies have their own well-stocked workshops and trained mechanics, some service capacity through a local agent or dealer is a virtual necessity.

Some of the larger mining equipment companies send technicians as required while others maintain their personnel locally, where they function as both sales and service reps.

A local manufacturing presence definitely has advantages - in most cases more responsive servicing, more spares (and sometimes machines) in stock, improved technical assistance. Manufacturing in Brazil in one form or another

(joint venture, manufacturing under licence, etc.) also creates a favourable image. As Brazil becomes more and more self-reliant in the manufacturing sector, tariffs will be prohibitive for those items imported into Brazil for which there is a national similar.

#### What are some of the Trade Barriers?

Aside from tariffs and taxes, the barriers that Canadian exporters of goods and services in the field of mineral development will face are many. Some are relatively simple to overcome; others are more formidable. The principal problems are:

1. Brazilian legislation designed to protect local manufacturers, and/or to prohibit foreign technical assistance unless that assistance develops an expertise not presently existing in Brazil. Goods and services are denied entry into Brazil for use by government agencies or companies receiving government incentives, if similar goods or services are available from local sources.
2. Many developments are either foreign-owned or have joint Brazilian/foreign participation. In almost all cases the foreign expertise is obtained and equipment chosen with full public knowledge of the operation. Close contacts with foreign as well as local companies is therefore imperative.
3. Projects tied to foreign financing from U.S., European or Japanese banks or development agencies, usually preclude equipment purchasing from other sources.
4. Since many Canadian equipment manufacturers are subsidiaries of foreign parents, they are often prohibited from exporting to South America in general and Brazil in particular. This is perhaps the major problem in heavy mining equipment and only if Canadian financing is involved will most parents allow their Canadian subsidiary to participate.

5. Low-cost loans for services by Brazilian Government entities such as the CPRM, BNDE, FINEP, etc. make it attractive for many mining companies to use local or government-owned companies to do the prospecting and provide the necessary services. Even if such services are not as complete as desired, the type of the loan usually compensates for the shortcomings of such a contract.
6. Language difficulties, while not always a big factor, do play a role in Brazil, where graduate geologists and technicians are often locally educated and do not have a good knowledge of English or French.

Brazil and Canada have a Most Favoured Nation tariff on trade between these two countries, under which the lowest tariffs usually apply.

The recently announced plan for the expansion of Brazil's iron and steel industry foresees expenditures of \$4 billion and a 26 million metric ton annual ingot capacity by 1980. The market to supply much of this equipment is dominated by Japanese companies, and very competitive prices will be needed if Canadian companies are to obtain a share of the market.

Although there are a number of projects on the boards, perhaps the two most important are the steel complex at Tubarao in the state of Espirito Santo, and the complex at Itaqui in the state of Maranhao.

Tubarao will consist of an iron and steel plant as well as 4 or 5 pelletizing plants and two rolling mills. Investment will be in the order of \$900 million, with Kaussaki of Japan and Italy's Finsider holding 49%.

Itaqui will be a \$2 billion investment. One of the problems for Brazil, however, is securing a long term supply of coking coal.

The type of equipment that will be bought off-shore will likely be the following:

- Pelletizing plants
- sinter plants
- oxygen furnaces
- coke ovens
- electric distribution systems.



For more information on Brazil's expansion programs, companies may wish to contact directly any of the following companies:

Companhia Siderurgica Nacional - CSN  
Av. 13 de Maio, 13 - 8o andar  
Caixa Postal 2736 - ZC-06  
20.000 Rio de Janeiro, GB - Brazil

Usinas Siderurgicas de Minas Gerais  
S/A - USIMINAS  
Rua Timbiras, 2349  
30.000 Belo Horizonte, MG - Brazil

Companhia Siderurgica Paulista - COSIPA  
Av. Sao Joao, 473  
01035 Sao Paulo, SP - Brazil

Canada's interest in Mining in Brazil dates back to 1875 when a young Canadian geologist organized the original Brazilian Geological Survey, which eventually evolved into the present DNPM\*. It is hoped that the Canadian companies engaged in mining and mining equipment and services will continue to take a deep interest in this promising market. The Canadian Consulates in Rio de Janeiro and Sao Paulo and the Embassy in Brasilia are ready to assist you in making inroads into this burgeoning area of activity.



CPRM - Companhia de Pesquisa de Recursos Minerais

Formed in 1969 and operational in January 1970, this company has four basic objectives. They are as follows:

- I) To stimulate the discovery and augment the utilization of Brazilian mineral and water resources.
- II) To guide, stimulate and cooperate with private enterprises in exploration and in studies intended for the utilization of water and mineral resources.
- III) To supplement, in a strictly limited capacity, private enterprises in the field of exploration for mineral and water resources.
- IV) To give administrative and technical assistance to entities belonging to the Ministry of Mines and Energy.

Within these objectives, the CPRM may also:

- A) Prepare studies and execute geological and hydrological works as well as carry out exploration for mineral and water resources.
- B) Carry out, directly or in cooperation with private enterprises, scientific, technological, economic and juridical studies intended for the exploration and utilization of mineral and water resources.
- C) Give technical assistance to public and private enterprises through the signing of contracts for the rendering of services.
- D) Develop and support the training and improvement of the technical personnel required for its activities.

DNPM - Departamento Nacional de Producao Mineral

Except for oil, which exploration, exploitation and refining is a state monopoly in Brazil, other minerals can be explored and exploited by nationals and foreigners upon the issuance of exploration grants and ultimately exploitation concessions.

Such grants and concessions are issued by the Brazilian Department of Mineral Production (DNPM), which is a counterpart of the provincial Mines Branch in Canada. In addition to adjudicating applications for grants and concessions, and the supervision of the use of grants and concessions through its Mining Development Division, DNPM as an agency of the Mines and Energy Ministry, is responsible for Brazil's mineral production program through Divisions of Mineral Economics; Geology; Legal and administrative. The recent creation of the federally-owned Mineral Resources Research Company (CPRM) has reduced DNPM's responsibilities for mineral exploration and mineral inventory maintenance.

### CVRD - Companhia Vale do Rio Doce

CVRD was created in 1942 to participate in the mining, transportation and trading in iron ore and its associated products. The federal government holds 80% of the outstanding shares through the National Treasury.

In 1973, CVRD produced 31.8 million tons of high grade iron ore from its open pit mines, using equipment including 12.9 yard shovels and trucks with capacities of 120 tons each.

The CVRD railroad, 550 kilometers (370 km double tracked) or 1 meter gauge track, hauled 1-7 million passengers and 41.7 million tons of iron ore, of which 4.8 million tons were mined by associated firms.

The railroad is integrated with a bulk materials port at Tubarao (near Vitoria, in Espirito Santo) which can unload railcars at 19,000 tons per hour, and accommodate ships of 270,000 TDW.

CVRD currently operates two iron ore pelletizing plants with a combined capacity of 5 million tons per year. A third plant of 3 million TPY is under construction in a joint venture with the Finsider group.

CVRD's subsidiaries include:

#### Shipping

- DOCENAVE, a deepsea shipping line with 900,000 TDW owned capacity, and two ships of 51,000 TDW to come onstream this year.
- NAVEGACAO RIO DOCE LTDA - a coastal shipping line for domestic service.

#### Marketing

- Itabira Eisenerz GmbH in Dusseldorf to market iron ore in Europe.
- Itabira International Ltd., New York, to market iron ore in North America.
- Rio Doce Europa S.A., Brussels, to supervise world-wide iron ore marketing.

### Reforestation

- Florestas Rio Doce S.A.
- Rio Doce Madeiras S.A., which together have 40 thousand hectares under reforestation in the states of Minas Gerais and Espirito Santo.  
The wood production is earmarked for paper pulp.

CVRD holds 50.9% of the shares of Companhia Meridional de Mineracao, a Brazilian subsidiary of U.S. Steel, for the development of the Carajas iron ore deposit in the state of Para.

CVRD is associated with:

- ten Japanese firms in Celulose Nippo-Brasileira S.A. - CENIBRA, for the construction of a 750 ton per day pulp mill.
- ALCAN in aluminum-bauxite production feasibility study.

In 1973 CVRD had sales revenues of US\$343.4 million and net profit of US\$129.3 million.



- 56 -

HYDROELECTRIC DEVELOPMENTS IN BRAZIL

Jorge M. da Costa,  
Commercial Officer,  
Rio de Janeiro

The Parana River rises on the plateau of south-east central Brazil and generally flows south for 1,826 miles, emptying in the Uruguay River to form the famous River Plate or Rio de La Plata. In the section of its course extending from Guaira to Iguacu, the Parana becomes a bi-national river and forms the boundary between Brazil and Paraguay. In this region, approximately 8.7 miles upstream from the International bridge across Foz do Iguacu (Brazil) and Puerto Stroessner (Paraguay), both nations have undertaken the construction of a \$4 billion hydroelectric project, the largest in the world, designed for an output of 12,600 MW when fully operational. The Itaipu Project, as it has been designated, will be implemented through the joint efforts of the Brazilian holding company ELETROBRAS, a government-owned corporation controlling the operations of electrical utility companies, and its Paraguayan counterpart, ANDE-Administracion Nacional de Electricidad. The Association of these two institutions gave birth to the consortium "ITAIPU BI-NACIONAL S.A.".

The preliminary study on the Itaipu Project was done in 1972 by IECO-ELC, a joint venture company between Morrison-Knudsen's "International Engineering Corporation" and Electroconsult of Italy, and the same group is currently working on the final feasibility report, just about to be delivered to Itaipu Bi-Nacional. MONASA, a Brazilian subsidiary of Canada's Montreal Engineering, has been retained to prepare the feasibility study on power transmission.

The Itaipu Project can be better visualized in the light of various figures that are illustrative of its magnitude. While the preliminary study contemplated the installation of 14 turbine-generator sets of 765 MW, this plan has been revised and the current report recommends 18 turbine-generator sets of 700 MW each, bringing up the total generating capacity to 12,600 MW as opposed to the original 10,710 MW. These sets would follow both in size and design the units being installed at Grand Coulee Dam. The reservoir will have a total capacity of 37,929 million cubic yards and an active capacity, at 23 meters drawdown, of 24,850 million cubic yards; flooding an area of 540 square miles - 309 in Brazilian territory and 231 in the

Paraguayan side. The main dam will have a length of 5391 feet and its maximum height, foundation to crest, will be 558 feet. The abutment dams (rockfill) that have been planned have a total length of 9186 feet and a maximum height of 197 feet. The basic construction materials to be used in the project amount to 1,850 thousand tons of cement, 71,400 tons of steel reinforcement for concrete, 5.6 million cubic yards of sand and 11.2 million cubic yards of coarse aggregate for concrete.

Although costs have become an unpredictable factor in view of the world's inflationary trend, it is worth noting that the heavy electrical equipment required by the project is in order of US\$650 million. The percentage of imported equipment in this total will depend to a large extent on the financing arrangements offered to and secured by the Itaipu Administration. Other cost estimates drawn from the 1972 report (and certainly outdated at this point) show a \$640 million figure for the construction of reservoirs, dams, spillway and approaches; \$155 million for structures and improvements, out of which \$123 million would be used for construction of powerhouses; \$19 million for acquisition of land and rights of way; \$100 million for the diversion canal. The first 700 MW generating unit is scheduled to begin operations in early 1983 and two or three additional units will be installed each year, until 1988, when 14 are expected to be operational.

Ten years ago, in 1964, the capacity of electric power generation installed in Brazil amounted to 6,840 MW (71.5% hydro + 28.5% thermal). In the following five years, this figure had been increased to 10,262 MW, or 50 percent above the 1964 level. Currently, it is estimated that the installed capacity reached a total of 17,426 MW (78.7% hydro + 20.4% thermal), 2.5 times greater than that of 1964. In terms of increase in power generating capacity, Brazilian performance was better than that of Canada, U.K., U.S. and Western Germany. Eletrobras studies indicate that Brazil must double her power capacity every 7 years to cope with a demand growing at 10 percent per year. The required investments in the power generation sector are, therefore, in the order of \$1,300 million per year, of which 80 percent are supplied from domestic sources and 20 percent from external financings. There are currently 32 power plants under construction which will gradually commence operations from 1975 through 1980, adding another 16,300 MW to the present capacity.

## South and Southeast Regions

The South (States of Rio Grande do Sul, Santa Catarina and Parana) and Southeast Regions (Sao Paulo, Rio de Janeiro, Espirito Santo and Minas Gerais), eventual users of Itaipu's power, comprise an area of 580,175 sq. miles - 223,058 and 357,117, respectively - and a population of 62 million, 44 million in the Southeast Region and 18 million in the South. These two areas have now available generation capacities of 2,080 MW and 12,700 MW, respectively. Forthcoming additions in the period 1975-1979 will raise the South Region potential to 3,690 MW.

The projects underway are as follows:

	<u>Type</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>Total</u>
Salto Osorio (ELETROSUL)	H	350	350	-	-	-	700
Jorge Lacerda (ELETROSUL)	T	-	-	125	-	125	250
Emilio Medici II (CEEE)	T	-	-	-	-	150	150
Itauba (CEEE)	H	-	-	-	250	250	500
Figueira (COPEL)	T	10	-	-	-	-	10
		360	350	125	250	525	1,610 MW

In the Southeast Region the rate of expansion of generating capacity, in the period 1975-1979, will correspond to 62 percent, somewhat lower than in the South (77%). The identification of the projects underway is as follows:

	<u>Type</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>Total</u>
Ilha Solteira (CESP)	H	1,600	960	-	-	-	2,560
Agua Vermelha (CESP)	H	-	-	-	-	690	690
Capivara (CESP)	H	-	640	-	-	-	640
Promissao (CESP)	H	-	88	-	-	-	88
Paraibuna (CESP)	H	-	86	-	-	-	86
Sao Simao (CEMIG)	H	-	-	-	750	750	1,500
Igarape (CEMIG)	T	-	125	-	-	-	125
Volta Grande (CEMIG)	H	110	-	-	-	-	110
Marimbondo (FURNAS)	H	350	700	350	-	-	1,400
Angra dos Reis (CNEN/FURNAS)	N	-	-	625	-	-	625
Small Plants		5	15	12	-	-	32
		2,065	2,614	987	750	1,440	7,856 MW



The third geographical region is the Northeast, where the generation capacity is at present 2,120 MW. The States included are Bahia, Sergipe, Alagoas, Pernambuco, Paraiba, Rio Grande do Norte, Ceara, Piauï and Maranhao, with a total area of 597,942 sq. miles and a population of 31 million. Here, the expansion program in the electric power sector calls for the addition of another 1,236 MW of installed capacity during the period 1975-1979. CHESF, the Sao Francisco Hydro-Electric Company, will have in operation their Moxoto plant, part in 1975 (108 MW) and in 1976 (324 MW); Paulo Afonso IV, in 1978 (375 MW) and 1979 (375 MW). CHESF will also complete by 1977 a small power plant, Castelo Branco, with a 54 MW generating capacity.

The North Region is formed by the States of Para and Amazonas, a vast underdeveloped area of 1,382,693 sq. miles with a population of 4 million. The present power consumption in the area is low (135 kWh per capita), the installed generating capacity is 426 MW, and the immediate additions planned until 1977 will increase it to a still modest total of 706 MW. Nevertheless the future growth of this zone justified the recent incorporation of ELETRONORTE, an ELETROBRAS subsidiary company formed in June, 1973. The Manaus Free Trade Zone stretching over an area of 4,000 sq. miles, in which all imports are duty-free, has been "discovered" by Brazilian and foreign investors, and a growing number of industrial projects are underway in the region now, thus increasing the power demand. In addition, Companhia Vale do Rio Doce and ALCAN will be exploiting the bauxite deposits of the Trombetas river through their joint venture Mineracao Rio Norte. Facilities for alumina production are planned and here, again, the need for more power is obvious. Another important project in the region is the Carajas, one of the world's largest iron ore deposits to be exploited by Companhia Vale do Rio Doce and U.S. Steel through their joint venture Amazonia Mineracao S.A. These developments justify the development of the Tucuruï Hydro-Electric Project (1,500 MW) on the Tocantins river, planned by ELETRONORTE for 1977.

The West Central Region (states of Goias and Mato Grosso) has an area of 725,657 sq. miles, with a population of 6 million and a per capita consumption of 186 kWh. Most of the power demand in the region originates from the fast growing populations of Brasilia, the Capital of Brazil; its two or three surrounding "satellite" towns, and Goiania, capital of the State of Goias. The area's industrial



development is small, with the specific usage of power for manufacturing activities, being about 0.3 percent of the national total for industry. CELG-Centraís Eletricas de Goias S.A. (an Eletrobras subsidiary) supplies the southern area of the state from its Cachoeira Dourada hydroelectric plant (136 MW) to which another 240 MW will be added over the 1974-1976 period (80 + 80 + 80 MW). While CELG is now supplying Brasília (600,000 people) through CEB-Companhia de Eletricidade de Brasília, the Capital will soon be receiving all its power from Furnas-Centraís Eletricas S.A. After 1977, ELETRONORTE plans to build the Sao Felix Dam on the Xingu river for an initial installed capacity of 1,000 MW.

According to Eletrobras calculations, the potential power of the Xingu and Araguaís rivers is in the order of 30,000 MW which, added to that of the Tocantins river, brings the total of the three rivers to some 40,000 MW. The company has been working on pre-feasibility studies regarding the utilization of this potential while following closely the world-wide progress in the long distance power transmission technology. Hopefully, it will be possible to use such energy in the large consuming centres of the Southeast Region, 900 to 1,240 miles away.

In this article the summarization of the main Brazilian power generation projects currently underway has been limited to the next five years, both to save the reader from an excessive amount of data and to facilitate an overview of the country's performance. However, Eletrobras has planned an overall installed generating capacity of 29,000 MW in 1980 and 45,000 MW by 1985. This capacity may well reach the levels of 70,000 MW in 1990 and 150,000 MW in 2000, considering an average growth rate of 10 percent up to 1980, 9 percent from 1980 to 1990 and 8 percent in 1990-2000.

In the year 2000 Brazil should have a population of 200 million and the projected 150,000 MW capacity would provide 750 watts per capita. Twelve nations had already reached this level 7 years ago, in 1967.

The substantial growth in Brazil's installed generating capacity programmed for the next 5 to 25 years provides excellent opportunities for Canadian expertise and capability in the electric power field. Canadian industry has supplied turbines, generators, transformers, circuit-breakers, switches and other equipment and materials to many of the Brazilian hydro and thermal electric projects. In addition to their recognition of Canadian technology,

engineering and advisory capability in this sector, Brazilian technicians keep a close watch on our developments and often point out the geographical similarities of the two countries, many vast areas of sparse population require long transmission lines. As mentioned above, the average annual Brazilian investment in electric power projects lies in the range of US\$1,300 million, of which approximately 20 percent is slated for foreign financing. The sources of these funds include the I.B.R.D. and the I.A.D.B., and E.D.C., the Eximbank, the Kreditanstalt Fur Wiederaufbau.

As might be expected, the steady growth of Brazil's requirements for heavy power equipment has stimulated domestic manufacturers to expand their facilities to obtain a larger participation in total sales. The government fully supports their efforts through incentives such as the 15 percent advantage extended to domestic manufacturers when their bids are compared with those from foreign manufacturers; the upgrading of domestic supplies to the level of usual exports, provided those are financed in hard currency (IBRD & IADB), thereby rendering such supplies free of practically all local taxes; or the very low financing rates offered by BNDE (the National Development Bank) and its affiliate organization for the local manufacture of equipment, which vary from 5 percent p.a. (for a domestic content of 51-55% in value) to 3 percent p.a. (for a domestic content greater than 75%), plus the addition of a monetary correction factor.

As a result of this policy, Brazilian industry is now capable of producing 55-60% of large turbine requirements (G.E., Voith, Mecanica Pesada, COEMSA, Bardella), while shafts and regulators must still be purchased abroad; 85% of generators up to 112,000 kVA, 78 r.p.m. (G.E., Brown Boveri, Siemens, COEMSA), with thrust bearings, forged steel shafts, excitation controls, silicon steel sheets, copper ingots and coils with epoxy insulation being imported; and 90% of transformers up to 440 kV (G.E., ASEA, Brown Boveri). Secheron and Alsthom manufacture circuit breakers domestically, but only up to the 138 kV class; it is generally believed that Brazilian expansion into larger sizes will be slower than in other types of electrical equipment. Microwave system components are totally imported. Transmission line towers are practically all of domestic manufacture (SADE, SBE). Insulators for transmission lines are also made locally by VIFOSA, but limited imports are still required to meet the demand.

Whether through direct sales, licensing arrangements or joint ventures, Canadian companies have access to a large potential market in Brazil. But they should be alerted to the fact that Brazilian utility companies usually make all purchases through public tenders or calls for bids, with participants pre-selected by the client. The pre-qualification procedure is widely advertised by the buyer and it is generally opened to all reputable manufacturers. The appointment of a manufacturer's agent in Brazil considerably helps business development. While actual bids are mandatorily submitted by the manufacturer and are later evaluated by a commission that cannot be directly influenced by the proponent's representative, his role in the pre-proposal phase, either as a contact-man, a public-relations agent or an advisor in matters of laws and regulations, position of competitors etc., should not be minimized.

Further information may be obtained from the Electrical and Electronics Branch, Department of Industry, Trade and Commerce in Ottawa; or from the Trade Commissioner Service offices in Brasilia, Rio de Janeiro and Sao Paulo.





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